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Original article

Deferred endoscopic urethral realignment: Role in management of traumatic posterior urethral disruption



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KEYWORDS

Urethra;
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Abstract

Objectives: The aim of our study is to assess the value of deferred endoscopic urethral realignment after traumatic posterior urethral disruption.

Patients and methods: Between June 2001 and August 2011, we evaluated 28 patients who presented 3–6 weeks (mean 27 ± 6 days) after experiencing traumatic posterior urethral disruptions and pelvic fractures; immediate and early realignment were overdue in these cases. Patient variables included mode of presentation, mechanism of trauma, type of pelvic fracture, and Abbreviated Injury Scale (AIS). Under fluoroscopic guidance, a guidewire was passed into the injured urethral segment from the distal to proximal injured ends using a long Chiba needle, and realignment was performed using endoscopic urethrotomy. The follow-up period ranged from 18 to 98 months (mean 43 ± 22.5 months).

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Results: After the procedure, 46% of patients were stricture free. After one visual internal urethrotomy (VIU) and two VIU's, 60% and 64% of patients were stricture free. No cases of post-procedural incontinence occurred, and impotence was reported in only 14% of patients. Type of pelvic fracture was the only variable that significantly affected the success rate, where the success rate decreased from 100% in stable pelvic fracture to 25% in bilateral rotationally and vertically unstable pelvic fracture.

Conclusion: When early realignment is postponed for any reason, deferred endoscopic realignment is considered an adequate substitute because urethral continuity can be achieved in a group of patients without increase incidence of impotence and incontinence.

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Introduction

Management of traumatic posterior urethral disruption is still divided between 2 lines of treatment. The classic approach consists of delayed repair, which entails a suprapubic cystostomy at the time of injury and delayed perineal approach urethral reconstruction 4–6 months after injury [1]. Urethral stricture, unfortunately, occurs in almost all patients treated initially with suprapubic cystostomy. Previous reports recommend early urethral realignment (immediate–15 days after trauma) [2–12], which results in a 30–70% decrease in the incidence of urethral stricture. However, some experts believe that this approach subjects the patient to a major operation at a critical time and provides little benefit for the effort expended [13]. Nevertheless, early urethral realignment for traumatic complete posterior urethral disruption is now generally encouraged to prevent intractable urethral stricture [2,14].

Occasionally, it is necessary to either defer urethral realignment or to adopt the classic delayed repair. This occurs when patients are in critical condition at the time of trauma, when realignment has failed, or when experienced surgeons and the necessary equipment do not exist at the trauma center where primary treatment is administered. In this study, we assessed the value of deferred endoscopic urethral realignment (more than 3 weeks after trauma) after traumatic posterior urethral disruption.

Subjects and methods

Between June 2001 and August 2011, we evaluated 28 patients who presented at our institution 3–6 weeks (mean 27 ± 6 days) after experiencing traumatic posterior urethral disruptions and pelvic fractures; immediate and early realignment were overdue in these cases. For all patients, a suprapubic tube was already in place for drainage of urine. Posterior urethral ruptures were diagnosed and confirmed by history, physical examination, and retrograde urethrography. Patient variables included mode of presentation, mechanism of trauma, type of pelvic fracture and AIS. Pelvic fracture was classified radiographically according to the Tile classification of pelvic injuries [15]. Type A pelvic fracture included stable injury with isolated pubic ramus fracture; Type B, a rotationally unstable but vertically stable pelvis (B1, open book separation of the pubic symphysis; B2, ipsilateral compression causing overriding pubic bone fracture); and Type C, a rotationally and vertically unstable pelvis with complete pelvic ring disruption or displacement at ≥ 2 points (C1, unilateral; C2, bilateral). For purpose of statistical analysis, each patient variable were collapsed into two subgroups only.

Technique of deferred endoscopic urethral realignment

The procedure was performed under spinal anesthesia with the patient in lithotomy position. The bladder was filled with contrast medium through the suprapubic tube, and the posterior urethra was visualized (under fluoroscopy) down to the site of injury, i.e., proximal end of the injured urethra. A urethroscope was then passed through the distal urethral segment up to the distal end of the injured urethra. At this point, the endoscope sheath was left in place in close proximity to this end, and other parts of the urethrotome (lens and working element) were removed (Fig. 1). A long Chiba needle was introduced through the urethrotome sheath until it reached the distal end of the injured urethra. Under fluoroscopic guidance (using anterior–posterior and lateral plane), the needle was passed not more than 1 cm from the distal to proximal ends of the injured urethra (Fig. 2) to avoid penetration of the prostate or bladder. The trocar was removed and urine aspirated from the needle to confirm that the needle had passed through the proximal end of the urethra. A Teflon-coated guidewire was passed through the needle until it reached the bladder. The urethrotome sheath was then removed and reintroduced alongside the guidewire (flexible cystoscopy was done through track of suprapubic tube to ensure proper entrance of guidewire distal to verumontanum). The granulation tissue in the path of the guidewire was incised using a cold urethrotomy knife until the

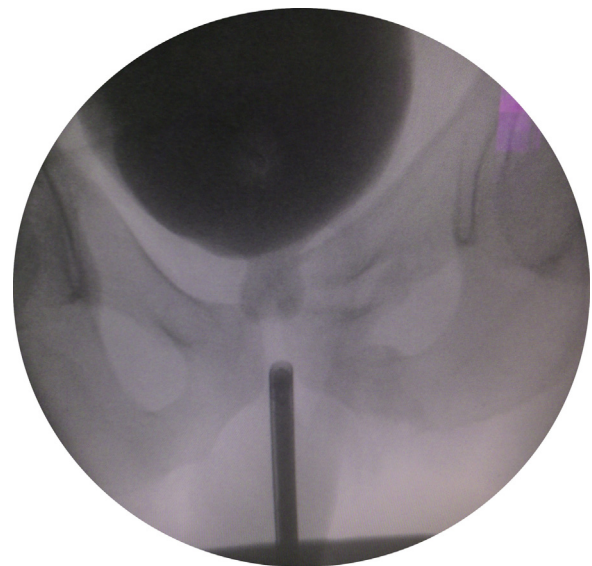


Figure 1 Endoscope sheath kept in close fitting to the distal end of injured urethra.

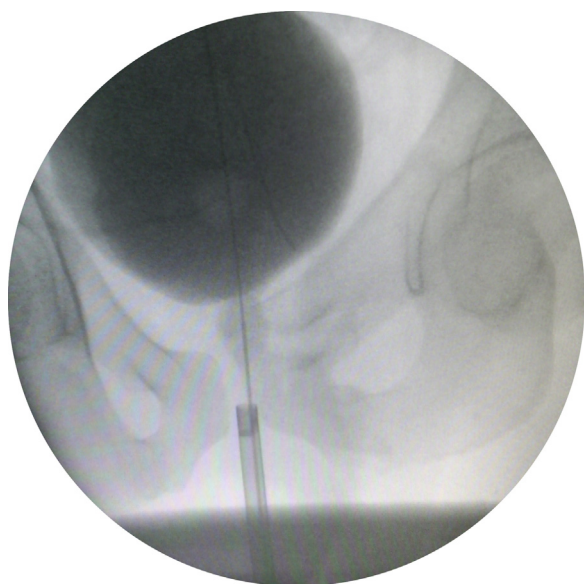


Figure 2 Teflon coated guidewire was passed through the needle to reach the bladder.

proximal end of the injured urethra was reached. A silicon catheter (18–20 French) was then introduced over the guidewire and left in place for 3 weeks.

All patients were followed up according to institutional protocol, i.e., they were instructed to return for routine follow-up evaluation every 3 months during the first year then every 6 months thereafter. Retrograde urethrography was performed if the patient had difficulty in urination; if maximum urine flow rate (Qmax) was <10 mL/min; or if the postvoiding residual urine volume (PVR), estimated on ultrasound, was >50 mL. Criteria of success included absence of symptoms of infravesical obstruction, Qmax persistently >15 mL/s and PVR persistently <50 mL. The success rate was calculated initially after realignment, (no requirement of VIU), after one VIU, and after two VIUs. Test of normality (K–S and Shapiro–Wilk test) for the follow up period revealed that the data was normally distributed ($p < 0.05$). Statistical analysis was performed with computer software (SPSS for windows; SPSS, Inc., Chicago, IL, USA) using Fisher Exact test analysis was used to compare the difference in proportions.

Results

Patient characteristics

The mean patient age was 32 ± 9 years (range, 18–56 years). The follow-up period ranged from 18 to 98 months (mean 43 ± 22.5 months). Urethral realignment was postponed because of critical illness in 16 patients (57%), failed early realignment in four (14%), and referral from primary centers with a suprapubic tube in place in eight (29%). The mechanism of injury was motor vehicle accident in 17 patients (61%), motor vehicle–pedestrian impact in seven (25%), and fall from a height in four (14%). Patients were classified according to type of pelvic injury and AIS (Table 1).

Overall success and failure rates

Of 28 patients with traumatic posterior urethral disruption and pelvic fracture, 13 (46%) were stricture free during the remainder of the follow-up period. Among the 15 patients who developed stricture, two presented with acute retention 2 and 3 weeks after removal of the catheter and required urgent suprapubic tube insertion until a second procedure could be performed. The remaining 13 patients presented with progressive difficulty in urination after removal of the catheter. All 15 patients with stricture were treated with VIU.

Of the 15 patients initially treated with VIU, 11 developed recurrent stricture after 4–12 weeks (mean 8 weeks) and all presented with difficulty in urination. Four patients were stricture free during the remainder of the follow-up period.

All 11 patients who redeveloped stricture after the first VIU were treated with a second VIU. Of these 11 patients, 10 developed recurrent stricture after 4–14 weeks (mean 8 weeks) and all presented with difficulty in urination; one patient was stricture free during the remainder of the follow-up period. All ten patients who redeveloped stricture after a second VIU were ready to undergo urethral reconstruction. Of these ten patients, three (30%) had progressive difficulty after 2–3 months and two were treated successfully with one VIU. The remaining patient refused another VIU and preferring to remain on periodic urethral dilation.

Success and failure in relation to patient characteristics

The success rate (i.e., overall success rate) in relation to mechanism of trauma, AIS, reason for deferred endoscopic realignment, type of

Table 1 Success and failure rate in relation to patient variable.

Variant	Subgroup	Success	Failure	P-value ^a
• Trauma	• Motor vehicle accident	16 (67%)	8 (33%)	0.452
	• Fall from height	2 (50%)	2 (50%)	
• AIS	• ≤Moderate	4 (100%)	0 (0%)	0.149
	• >Moderate	14 (58%)	10 (42)	
• Reason of deferred realignment	• Critically ill	10 (63%)	6 (37%)	0.570
	• Failed realignment	8 (67%)	4 (33%)	
• Pelvic injury	• Type (A & B)	15 (83%)	3 (17%)	0.01
	• Type C	3 (30%)	7 (70%)	
• VIU	• No	13 (100%)	0 (0%)	<0.001
	• Yes (once/twice)	5 (33%)	10 (67%)	

^a Fisher Exact test analysis was used to compare the difference in proportions.

pelvic fracture and VIU is presented in Table 1. Only type of pelvic fracture significantly affected the success rate. No correlation found between time of deferred endoscopic realignment after injury and success rate ($p > 0.05$).

Impotence and incontinence

No patients became incontinent after operation. Four patients (14%) experienced weak erection. There is a correlation found between the degree of pelvic fracture and occurrence of weak erection ($p < 0.05$). Two of these patients had experienced type C2 pelvic fracture; one of them is able to achieve adequate erectile function with Sildenafil therapy, whereas the other remains with weak erection. Of the two other patients with weak erection, one had type B2 pelvic fracture and the other had B1 pelvic fracture. Both of these patients responded positively to Sildenafil and were able to achieve intercourse without aid of any medications after 6–9 months of drug therapy.

Discussion

Wound healing progresses through 3 broad but overlapping phases that are important for physicians to recognize: (1) the inflammatory phase, (2) the fibroblastic phase and (3) the remodeling phase. The inflammatory phase starts immediately after injury and is completed in 4 days. If too much inflammation occurs, excessive scarring is produced. The purpose of the fibroblastic phase is to resurface and impart strength to the wound. In the remodeling phase, scar tissue (glue) that formed in the proliferation stage begins to orientate itself and become more functionally specific. This last phase ends at 6 months to 1 year after injury [16].

To avoid wound re-inflammation, it is better to postpone therapeutic intervention until after end of the inflammatory phase. The fibroblastic phase or the early remodeling phase is an optimum intervention period. Deferred endoscopic urethral realignment can be performed with similar results as those of early realignment because both procedures are performed during the same period of wound healing and before termination of the remodeling phase. However, deferred endoscopic urethral realignment is more difficult because the scar is more stabilized.

Thus, realignment reduces the requirement for secondary open urethroplasty. In addition, most of the resulting strictures can be treated with urethral dilatation and/or VIU as an outpatient procedure. The remaining issue is whether early, deferred, or delayed realignment is the preferred treatment schedule.

Most published studies on early realignment show that early realignment, performed between 0 and 14 days, can decrease the incidence of stricture formation with initial success rates of 0–76%; after one VIU, 30–93%; and after two VIUs, 87–100%. The reported impotence rate was between 14% and 55%, and the incontinence rate ranged from 14% to 55% (Table 2).

In the present study, early realignment could not be performed because of critical illness, failed attempt at early realignment, or referral from a center where facilities for realignment were not available. Most of the patients in our study were critically ill at the time of trauma (57%). Endoscopic realignment was deferred for 3–6 weeks in these critically ill patients, depending on when their health

Table 2 Results of realignment for posterior urethral disruption.

Studies	No. of patients	Interval between injury and realignment	Initial success	Success after one VIU	Success after two VIUs	Impotence rate	Incontinence rate	Follow up period by months
Kotkin (1996) [12]	32	Immediate or early after trauma	50%	–	–	25%	18%	13–115 (mean 51)
Elliott (1997) [11]	57	Within 6 h	34%	–	No VIU	21%	3.7%	Up to 480 (mean 126)
Porter (1997) [10]	13	0–11 days	50%	–	–	14%	0%	2–31 (mean 6.1)
Jepson (1999) [9]	8	0–19 days	50%	75%	87%	37%	12.5%	35–85 (mean 50.4)
Moudouni (2001) [8]	27	0–8 days	59%	81%	88%	14%	0%	18–155 (mean 68)
Shittu (2003) [7]	12	10–14 days	67%	–	No VIU	20%	–	15–72
Mouraviev (2005) [6]	57	Immediate	51%	74%	–	34%	18%	12–284 (mean 105)
Salehipour (2005) [5]	25	Within 12 h	76%	–	88%	16%	0%	9–27 (mean 20)
Hadji Zacharia (2008) [4]	14	0–2.8 days	71%	93%	100%	–	–	0.5–20.5 (mean 7)
Sofer (2010) [3]	11	3–72 h (mean 48 h)	55%	64%	–	55%	0%	24–84 (mean 51.6)
Chang (2011) [2]	11	0–14 days	9%	30% after 1.8 urethrotomy/patient	–	–	–	24
Current study (2013)	28	3–6 weeks (mean 27 days)	46.4% (26.7–66.1%) ^a	60.7% (41.4–80%) ^a	64.3% (45.4–83.2%) ^a	14% (12.2–15.8%)	0%	18–98 (mean 34)

^a Percentage (95% CI).

improved sufficiently to permit surgery. Our results were similar to those obtained using early realignment, with an initial success rate of 46%, after one VIU of 60%, and after two VIUs of 64%. However, improvement of the success rate occurred mainly after one VIU and slightly after two VIUs, which raises the question whether a second VIU is useful or not. Impotence occurred in 14% of our patients, and none reported incontinence.

In 2011, Chang and his colleagues performed realignment for 11 patients after more than 4 weeks of trauma, with disappointing results. All of their patients developed recurrent stricture even after an average 4 urethrotomies per patient. This success rate for early realignment was the lowest among published studies (9–30%) [2].

In 1988, Chiou et al. performed delayed realignment for eight patients from 2 months to many years after injury, with very satisfactory results. Six of the 8 patients remained stricture free for more than 2 years after two to three urethrotomy procedures [17]. However, this operation is not currently accepted, most likely for the following reasons. First, because of the marked improvement in the results of delayed urethroplasty, most surgeons prefer to perform urethroplasty when treatment has already been delayed. Second, transurethral sectioning of an extensive scar is difficult especially when a long urethral gap exists.

We found that the degree of pelvic injury is the only factor affecting the success rate of deferred endoscopic realignment. The presence of a long urethral gap in association with more severe urethral injury may explain this finding.

The impact of earlier urethral interventions on the outcomes of anastomotic urethroplasty in post-traumatic stricture urethra is still questionable. Recent study found that failed urethrotomy influence the outcome and is a predictive of failure of urethroplasty [18]. Other studies stated that it may not affect the outcome of urethroplasty [19], or affect the outcome if more than 2 times [20]. In this study, we obtain 70% initial success rate after anastomotic urethroplasty, which is close to the success rate of primary urethroplasty in published studies [18,21]. This may denote the little impact of two VIUs on the subsequent urethroplasty.

Conclusion

We conclude that realignment is a viable treatment option regardless of its timing. When early realignment must be postponed for any reason, deferred endoscopic realignment is an adequate substitute because urethral continuity can be achieved in a group of patients without increase incidence of impotence and incontinence.

Conflict of interest

The authors declare that there are no conflicts of interest.

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